TECHNOLOGY DEPT.

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LII
No. 1350

SATURDAY, MAY 12, 1945
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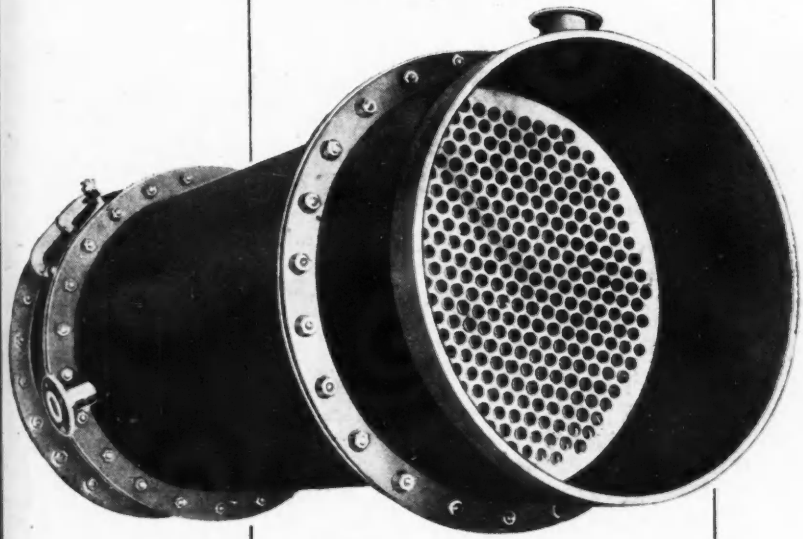

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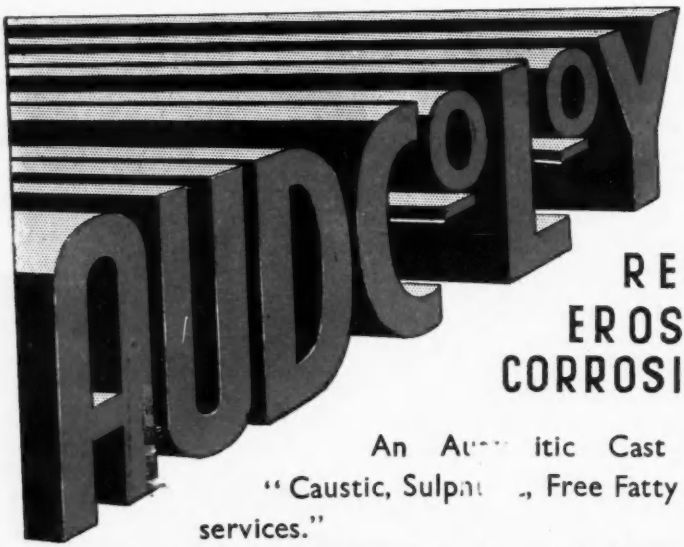

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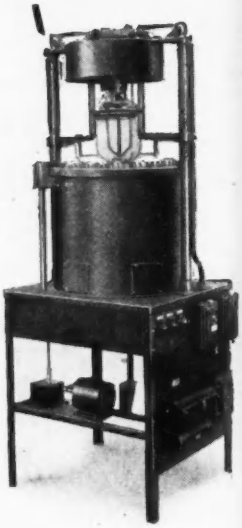

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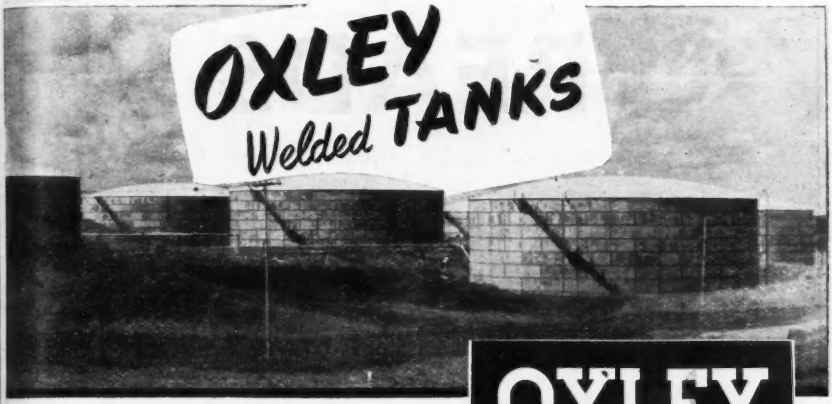

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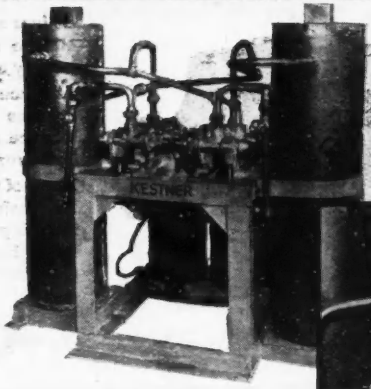

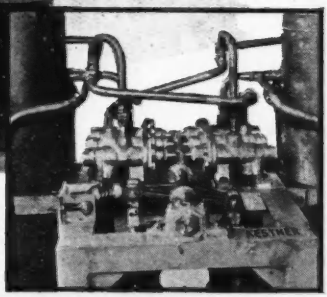

Illustration left: Drying Unit.
Illustration below: Close-up of the Automatic Regenerator and Changeover Valves.

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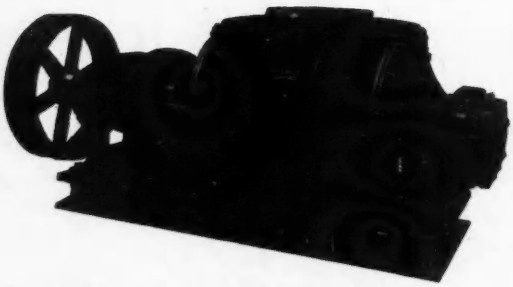

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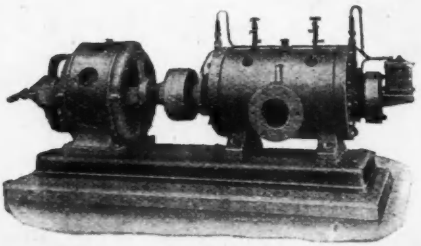

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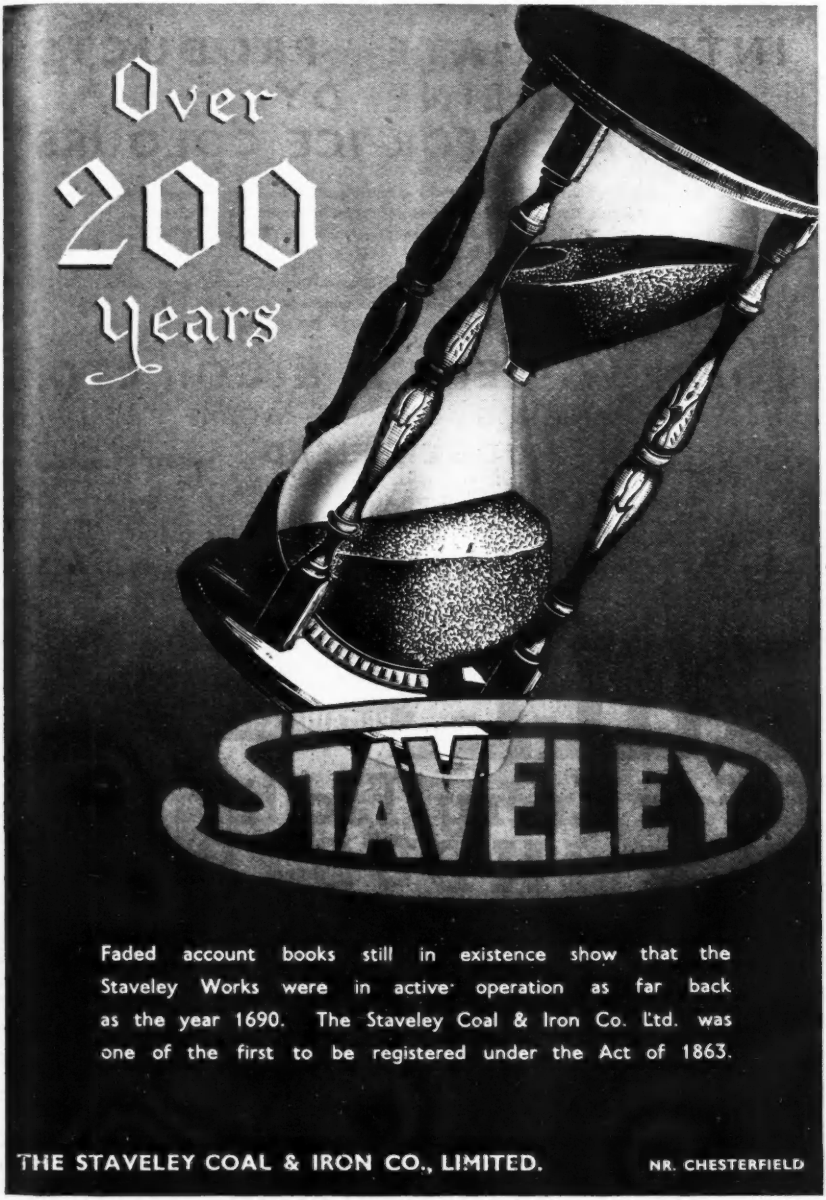

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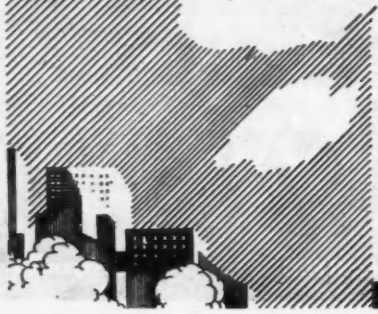

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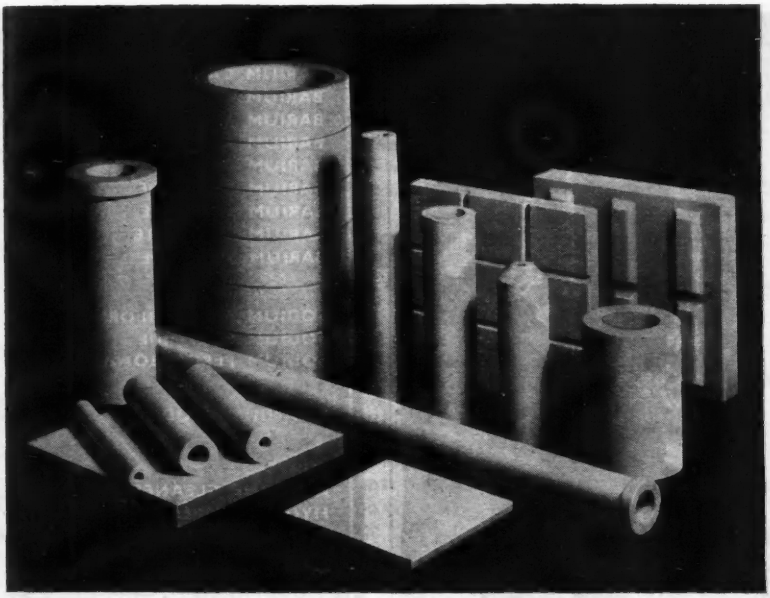

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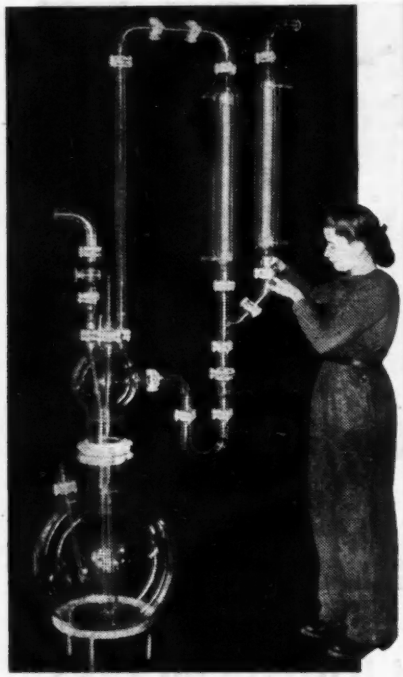

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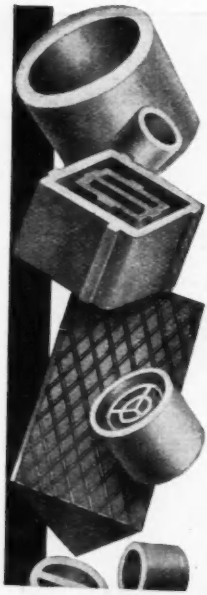

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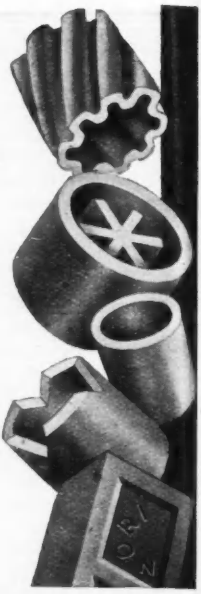

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VOL. LII
No. 1350.

May 12, 1945

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Victory—and After

GERMANY is no longer a military power. The shouts of "Heil Hitler" die away to be succeeded in due course by the execration that the mob reserves for its fallen idols. The Reich that was proudly boasted to last for a thousand years lies in ruins, a terrible object-lesson to future generations of the vanity or human vainglory. Rudyard Kipling, the poet of the British Empire, put into words which are to-day sung in our churches the warning and the prayer which the Nazis forgot:

"For heathen heart that puts her trust
In reeking tube and iron shard,
All valiant dust that builds on dust,
And guarding, calls not Thee to guard,
For frantic boast and foolish word—
Thy mercy on Thy People, Lord!"

And what shall we say of boastful Hitler to-day? Edmund Burke, nearly 200 years ago, wrote words which so exactly fit the case that we shall not attempt to better them: "I cannot conceive," he wrote, "any existence under heaven (which in the depths of its wisdom tolerates all sorts of things) that is more truly odious and disgusting than an impotent, helpless creature, without civil wisdom or military skill, bloated with pride and arrogance, calling for battles which he is not to fight, and contending for a violent dominion which he can never exercise."

Twice in our generation have the Allied Nations taken up arms against this predatory and arrogant foe. Twice have they humbled it. This time there must be no resurrection of its military might. Nations great and small have fallen in those titanic struggles—and have risen again. Many anxious years have passed, much of our heritage of buildings and possessions has been destroyed, since that fateful month of June, 1940, when Britain stood behind her last rampart, the sea, and Winston Churchill declared for all of us in words that will echo down the ages: "We shall fight on to the end, we shall fight in France, we shall fight on the seas and oceans, we shall fight with growing strength and confidence in the air, we shall defend our island whatever the cost may be, we shall fight on the beaches, we shall fight on the landing grounds, we shall fight in the fields and in the streets, we shall fight in the hills; we shall never surrender."

In no vain spirit we recall that those who would live by the sword have perished by the sword. There are still the Japanese to beat, but be the task long or short, the outcome cannot be doubted. Our thoughts to-day must turn to the future. A world in ruins must be rebuilt. Never again must there be the disastrous cataclysm of a world war. It was all very well to say that war is a natural condition when wars were confined to the sword, the spear, the bow and arrow, and even when the rifle and the cannon came into use. The increase in destructiveness during the last thirty years, due to the application of science to warfare, has been so terrifying that the consequences of future wars cannot well be predicted. Mankind is on the way to destroying itself. Self-preservation must cause mankind not only to say "never again," but to mean it.

There is much work that lies to our hands. There are backward nations to bring forward to a fuller state of civilisation so that they too may enjoy the standard of living to which we are accustomed. There are fallen nations to raise. There are undemocratic nations to educate so that they may take their place in a democratic comity of peoples. The work that lies to our hands is so immense that, if tackled resolutely, it will keep us busy for many generations. The politicians are anxious, indeed appear resolved, to restart their Party squabbles, to proclaim petty Party parrot-cries as the panacea for all problems. Must we quarrel among ourselves? Must one Party shout for private enterprise and another for nationalisation and split the nation on these foolish issues? Must millions of men strike for trifling "rights" when there is so much to be done in the world and so little time to do it in? If all will work together to the common end, how much, how very much, might be accomplished!

We have a high mission. Britain, the British Empire, the United States of America, and other great democracies must lead the world to sanity, to morality and to the enjoyment of the amenities that science has made possible. Through the mercy of Heaven we have been delivered from a great danger—perhaps the greatest danger that the world has faced within historical times. A high mission and a great task lie immediately ahead of us. Words uttered by Winston Churchill in 1940 equally fit the coming years: "Let us therefore brace ourselves to our duties, and so bear ourselves that if the British Empire and its Commonwealth last for a thousand years, men will still say, 'this was their finest hour.'"

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NOTES AND COMMENTS

"VE" Luncheon

WE were happy to spend part of VE-Day celebrating with a select party of chemical merchants and manufacturers. The atmosphere, as befitted the occasion, was one of not too restrained gaiety, and the speeches dealt, appropriately, with the possibilities of relaxation of controls at the earliest convenient moment. The merchants, especially, are eager to resume conditions of trading in which they can work unhampered by official restrictions, and, as the Coal Tar Controller said, that happy consummation depends on nobody so much as themselves. In point of fact, the control of the chemical trade has been exercised with a notable lack of friction between controllers and controlled; and the eventual transition to freer trading conditions should come about without any great disorganisation in the process. Chemical merchants are, from the very nature of their business, intelligent men; and they will be the first to see that the national interest and their own prosperity are one and the same thing, when the time comes for decontrol. It was a happy augury that the luncheon party adjourned to hear the Prime Minister's message of victory in Europe; his words to the London crowd—"This is *your* victory"—are a reminder that the nation has acquired an asset which it must not waste in the hard days to come.

Chemical Plant for Turkey

SOMETHING in the nature of a VE-Day bonus for chemical plant makers was provided by the announcement, on Tuesday, of the signature in

London of the Anglo-Turkish Trade and Payments Agreement. The Turkish Government hopes that British capital, industry, and enterprise will take an interest in Turkey's plans for reconstruction, in the course of which a sum equivalent to about £30 million a year will be spent, in excess of normal expenditure, on public and industrial works, including the increase of coal output and the development of the chemical and steel industries, and other undertakings for which Turkey produces raw material. In order to carry out these projects Turkey will need financial help, machinery, and technical advice. She hopes to find these principally in Britain, and it is to be hoped that British chemical plant makers and chemical technologists will not lose this opportunity of taking advantage of the excellent relations that have been maintained between the Ankara Government and our own.

Questionnaire

TRUE to its democratic traditions, the British Association of Chemists, or at any rate its London Section, has been trying to find out, by means of a questionnaire, the wishes of the rank and file of its members concerning the conduct of sectional affairs. We do not know whether he is justified in his belief, but the honorary secretary of the London Section has informed us that, to the best of his knowledge, this is the first systematic inquiry of the kind which has ever been attempted by any organisation of chemists, or, for the matter of that, of any kind of technical people. Obviously, an honest answer is more likely to be obtained by this means than when the rank and file are overawed by the great men on the committee on the occasion of a meeting. In point of fact, the results of the questionnaire are not surprising, and they go to show that the average working chemist is a man of common sense. Evenings in the middle of the week are preferred for meetings, though some would not mind turning up on Saturday afternoon. Week-day afternoon meetings are frowned upon. Technical subjects and professional subjects are preferred for lectures, and though not a few would like to see scientific films, there is little demand for debates or purely social functions. It is interesting to note that the geographical distribution of branches is greatly preferred to the organisa- of factory groups. The number of questionnaires returned represents 34 per cent. of total membership, not a bad showing in these busy days. The committee deserves congratulation on its sound democratic enterprise.

Therapeutic Research

LORD TRENT'S speech last week, in his capacity as chairman of the Therapeutic Research Corporation of Great Britain, Ltd., gave good indication of the value of co-operation, as betokened by the success attending the co-ordinated research work of the member-companies of the Corporation. Not unexpectedly, pride of place was given to an account of the conjoint research on penicillin, leading to the development of large-scale methods of manufacture. It was noted that, of the total quantity of penicillin manufactured in Great Britain in 1944, some 90 per cent. came from the plants operated by the member-companies of the Corporation. Monthly output is still on the increase. The combined research teams are working, under Professor Heilbron, on the chemistry and synthesis of penicillin, and their studies are linked, through arrangements made by the Medical Research Council, with other academic and industrial workers in the same fundamental field both in this country and in America. Collaborative preparation of potential tuberculocidal substances has also been maintained, in close co-operation with Sir Robert Robinson and other workers. Lord Trent quoted, as an instance of the way in which the thorough investigation of collaborative research justified itself, their independent examination of the claim of patulin to be a specific for the common cold. These investigations had not substantiated the early claims made for patulin, and, in consequence, it had not been adopted as a remedy.

The Estonian shale oil industry, wrecked by the retreating Germans, is reported to have been restored to as much as 80 per cent. of its former capacity. A new refining plant is to be opened early in May for supplying local agriculture with tractor fuel. In 1939, Estonian shale oil production amounted to 190,000 tons.

The Road to Victory

The Share of the Chemical Industry

AT a successful journey's end it is always pleasant to look back over the hardships and mischances of the road, as well as on its more agreeable incidents. This week we have surely completed, with a fair measure of success, one of the hardest journeys mankind has ever had to travel in all human history. Germany is completely defeated, and defeated, as some would have it, by "a lot of amateurs." Like so many other British characteristics, however, this amateurishness is only apparent; and it was against the hard steel core beneath the smiling surface that the German war-machine smashed itself to scrap iron. In their fury of disappointment at finding our democracy less decadent than they expected, they favoured us with a special measure of hatred, and launched against us a special selection of weapons devised with diabolical ingenuity. Our industries have had a hard task in meeting the German onslaught, but they have fulfilled it; and the time is ripe for a brief review of the part the chemical and allied industries have played in the achievement of victory.

Any such review must necessarily be brief, for the curtain has not yet been fully raised behind whose security a great part of the work has had to be carried out. The broad lines, however, are visible, and the details are gradually taking more and more definite shape, ready to be published one day, we hope, in something near entirety.

Willing Service

In a general way, the chemical industries, like most others, as soon as the war broke out placed their entire resources at the disposal of the Government. This implied not merely a change-over from normal production to the supply of munitions of war, but also the seconding to the Service and Supply Departments of many of the most skilled executives, not to mention the call-up into the Services themselves of the youngest and most vigorous workers in all branches. Many a tried worker, whether on the board of management, in the laboratory, or in the workshop, who had been looking forward to a well-earned retirement, was obliged to remain in harness to fill up the resultant gaps, and the service thus rendered has been invaluable.

Chemical and chemical engineering research has made vast strides, and the resultant development has been, to say the least of it, astonishing. A good deal of research—at any rate that which has come to light—has been directed not so much to the primary purposes of war, as to the amelioration of conditions arising out of war—the control of disease, the increase of crops, the regulation of diet, the facilitation of transport and the like.

New Products

The development of the manufacture of penicillin is outstanding as an example of the combination of different types of reseach work. This is not the place to go into details of the discovery and development of the drug itself; but less attention has been called to the brilliant work on the part of chemical engineers in devising equipment by which extremely accurate control essential to the manufacture of penicillin could be applied on a commercial scale. In general, it is not widely enough realised how much is owed to the chemical engineering in the development of products to a practical stage, and how, without this aid, many valuable discoveries would languish in the laboratory, never to come to full fruition.

The story of many of the new insecticides is the same. The chemist discovered the principle, while his colleague, the chemical engineer, designed plant and methods of control whereby the product could be turned out on a useful scale. The application of fertiliser is another combined job; and here the chemists have been faced with a good deal of uninformed criticism. Like many other chemical products, chemical fertilisers are dangerous if used ignorantly, for it is no easier to "get rich quick" by the use of chemicals, and to *stay rich*,

than by any other means. The necessity has been imposed on the chemical industry of justifying the use of chemical fertilisers by pointing out that they are not a panacea for all ills, but a useful adjunct to other methods of crop improvement. It has been a hard task to surmount the prejudice derived from the undesirable results due to injudicious use of fertilisers; but we believe that this has been achieved.

Heavy Chemicals

The heavy chemical industry, the mainstay of so many other types of industrial activity, has remained in its usual place—the background. A few flashes of what has actually been going on there, however, have been allowed to penetrate to the light of day. In his review of the heavy chemical industry in THE CHEMICAL AGE last January, Mr. P. Parrish pointed out that in this country we had continued to manufacture annually the equivalent of about 2,000,000 tons of 70 per cent. sulphuric acid, about half of which was produced by the contact process and the remainder by the nitration, or chamber process. This in itself is no mean achievement, especially when it is remembered that the war-time demand for sulphuric acid is ultra-intensive, that transport of the acid to places where it was needed has presented great difficulties, and that the need for repairs to plant has been extensive and not easy to carry out.

Last February, Lord McGowan was able to publish some details about I.C.I.'s war effort. This really started in 1935, with the erection of a £3,000,000 oil-from-coal plant—which, it will be remembered, was not set up without violent opposition in Parliament and in the Press. It was not fashionable at that time to make preparations for war; the cure-all was appeasement. Since then, entirely new factories, involving the expenditure of £61,000,000, have been put up by I.C.I.; these factories belong to the Government, but to I.C.I. must go the credit for having built them, and for operating them to make materials of which they either had manufacturing experience, or on which they had carried out research.

Details of some of the newer products of these factories have been permitted to emerge piecemeal, such as the story of Ardil, the new cellulose textile; of Polythene, with its manifold applications—one of which was recorded in our columns only last week—and of Gammexane.

Further facts will be disclosed when the story of other branches of the chemical industry are told. An account of the war-time researches of the B.C.U.R.A. will undoubtedly include some startling revelations and the achievement of the gas industry will be found to be of the highest interest and importance.

Hydrogen Production

An inkling of what has been going on there was allowed to come to light last December, when Press representatives were invited to visit a plant where hydrogen had been produced and filled into cylinders for the supply of barrage-balloon centres and sites. The demand for hydrogen rose to a figure far in excess of peace-time requirements, and as the few industrial sources normally producing hydrogen were located in the North of England, the co-operation of the gas industry throughout the country was sought, in order to overcome transport difficulties. As a result, from September, 1940, to September, 1944, 1773 million cu. ft. of hydrogen were supplied from the gas industry, a truly stupendous effort.

Some idea of the way in which the gas industry shouldered the burden of producing this chemical may be derived from the change in the ratio of output. In 1940, gasworks produced 43 million cu. ft. of hydrogen, while all other sources were responsible for 545 million. In the first nine months of 1944 the corresponding figures were 431 million and 157 million. An interesting sidelight is afforded by the fact that coal gas was at one time used as an inflation medium, when a shortage of hydrogen was envisaged. The gasworks rose so nobly to the occasion, however, that a hydrogen-coal-gas mixture had only to be used in an emergency.

Official Statistics

Illuminating, yet unsatisfying glimpses of the total war effort of the chemical and allied industries are afforded by a perusal of Command Paper 6564, published last November by H.M. Stationery

Office under the somewhat uninspiring title: *Statistics relating to the War Effort of the United Kingdom.* In the introduction of this it is pointed out that if Lend-Lease supplies from the United States and Mutual Aid from Canada had not been received, it would not have been possible to devote the resources of the United Kingdom to such an extent to direct war purposes. At the same time, the United Kingdom has itself made available considerable quantities of supplies to the Allies.

The real crux of the matter, as revealed by Cmd. 6564, lies in what we have gone without in the way of ordinary industrial supplies. To list these "negative" figures would necessitate reprinting the better part of that publication. There are, however, a few positive figures worthy of record at this crucial juncture in history.

Non-Ferrous Metals

Take the non-ferrous metal industries, for example. Some of the most outstanding increases in production have been made in the light metals industry to meet the requirements of aircraft and incendiary bomb production. Magnesium production is more than eleven times the pre-war rate—an achievement which has meant the creation of virtually a new industry. The average production in 1935/38 was 2000 tons; by 1943 the figure had risen to 23,000. In aluminium the 1935/38 figure of 18,000 tons had increased within the same period to 56,000.

Production of explosives and propellants showed a similar upward trend, as might have been expected. In 1940, the output amounted to 120,900 short tons, while in 1943 the corresponding figure was 300,100, and in the first half of 1944, 123,300 short tons.

The mobilisation of man-power in the chemical and allied industries constitutes an impressive record. Lord McGowan revealed that the number of employees in his company rose from a pre-war figure of about 70,000 to over 120,000—not counting about 15,000 on active service at home and overseas. The total figures throughout the chemical and metal industries are equally impressive. From 2,600,000 in June, 1939 (16.2 per cent. of the male population), the figure rose to 3,305,000 in June, 1943, and though there was later a slight falling off, mainly owing to military exigencies, the total in June, 1944, was 3,210,000—20.2 per cent. of the male population of the country.

The figures for women are even more significant: from 506,000 in June, 1939—a mere 3 per cent. of the female population—the force of women employed in the chemical and metal industries increased to 1,928,000 in June, 1943, to 1,851,000 in June, 1944—11.6 per cent. of the total female population of Britain, a most remarkable record, especially considering the processes involved.

Truly, the chemical industry and the men and women that compose it have served their country well during its greatest hour of need. To-day, we can give no more than a summary of their heroic effort—"the arithmetic of blood, the chemistry of sweat, the accountancy of tears"—but as time goes on, their story will be unfolded page by page. The achievements of the researchers, striving against time to counter and to outstrip the ingenuity of the enemy; the contrivances of the administrators, adjusting new plant and pulling together new teams of workers; and the herculean effort of the workers themselves, scientific, manual, or clerical, to deliver the goods on time and up to standard, very often under conditions approximating to a front-line combat: all these deserve detailed record, and it is our hope that in due time such a record will be provided.

PERMIT PRICES OF OILS

The Ministry of Food draws the attention of traders to the fact that the permit price lists for oils and fats, issued periodically by the Ministry, apply to the home trade only. To minimise fluctuations and to ensure that each oil is reasonably priced in relation to other oils these prices are fixed broadly by reference to costs as a whole, but the individual prices do not necessarily reflect the cost of the particular oil. Oils allocated for export purposes will be priced by reference to the current cost of the particular oil to be supplied. Traders requiring allocations for export are warned, therefore, to apply to the Ministry of Food, Oils and Fats Division, Rothesay Hotel, Colwyn Bay, for the current price before themselves entering into commitments. A list of export prices will be provided on application.

FUEL EFFICIENCY IN THE CHEMICAL INDUSTRY

Fuel Economy Discussions

III.—Boiler House Instruments and Automatic Control

by A. L. HANCOCK, B.Sc. (Eng.)*

THE first attempts at manual control of boilers showed the need for certain instruments, two of which rapidly became standard. These were the gauge glass and the pressure gauge. As the size and complexity of boilers steadily increased, more instruments became necessary and this development was reflected by great development in the instruments available. Gauge glasses and pressure gauges are now infinitely better than the earlier examples; moreover, other instruments have been introduced, such as steam and water meters, temperature-measuring instruments of various types, gas-analysis and smoke-density instruments, and so on. Each advance in the instrument field was, of course, due entirely to a demand from boiler operators who found the need for a certain instrument to help them to attain good control. It was not only the increase in boiler size which encouraged this development: even with the smallest boilers the need for economy in fuel, and frequently the extreme poorness of the efficiency in everyday operation, led to the widening demand.

Modern Method of Control

The gradual extension of the use of instruments led to a change in the method of control. The operator began to rely more and more on the instrument readings to show what adjustments or attention might be necessary to maintain the desired conditions. The parallel increase in the size of the boiler unit made it inevitable that the instruments and the means of control should eventually be centralised. The normal present-day practice, then, is to collect on a central panel all those instruments which the boiler operator needs to give him a complete picture of the boiler operation at the moment, together with all those controls which he needs to correct any deviations from the desired conditions.

This extremely brief review of the development of boiler plant instruments and controls is necessary to explain the next step which is now being taken. With remote control, as I have described it, the operator's duty becomes that of watching for deviations from the desired values as shown to him by the instrument readings and correcting these deviations by the remote controls provided.

Now, all the reactions of the boiler operator are dependent upon observation and judgment. He must first note from the measuring instruments the change which has to be compensated, and take account of its magnitude and direction. He is then obliged to exercise judgment in order to determine the amount of the correction to be applied, then to apply that correction through a series of semi-automatic devices which have to receive attention one at a time. At any point he may be in error and, in any event, the exactitude of the correction will be governed by the quality of his judgment. Therefore, his corrective action can be based only upon trial and error and a series of corrections becomes inevitable. The logical next step in progress is therefore to utilise the instrument readings themselves as the means of applying the necessary correction. By this means we avoid the two great limitations of the manual operator, his variable time-lag and his variable judgment.

Factors Requiring Adjustment

Let us turn now to the factors which require continuous readjustment in the running of the boiler plant. We may list these factors as: (1) the supply of water; (2) the supply and distribution of fuel; (3) the supply and distribution of air for combustion; (4) the combustion-chamber draught (in balanced draught systems); and (5) the superheat (in some installations).

The supply of water is, of course, basically decided by the boiler water level. Similarly, the supplies of fuel and air are decided by the steam pressure. The correct control will maintain a suitable water level and a suitable steam pressure. Further, fuel and air must be supplied in the correct ratio in order that proper combustion conditions may be maintained. Next, the combustion chamber draught is kept constant in the system of balanced draught generally used; and finally, the superheat or total steam temperature is a most important factor which can sometimes be controlled independently as, for example, by a desuperheater or attemperator.

The first point—the supply of water—is now generally subject to automatic control. Automatic feed-water regulation is commonplace and argument as to is merits has practically ceased. To maintain the water level by manual control was found to be beyond the capacity of the manual operator and

* Electroflo Meter Co., Ltd.

automatic control is now universally trusted with this most important and arduous duty.

Passing over the question of fuel and air supply for the moment, we will refer to combustion-chamber draught, which happens to be a particularly easy job for automatic control. It is also quite a difficult job for hand control. For these reasons, it is not surprising that in recent large installations the automatic control of combustion-chamber draught is practically standard practice. The principle adopted is that the air flow through the boiler is determined by regulation of, say, the induced-draught fan; the draught in a combustion chamber is then controlled automatically by regulation of the forced-draught fan. The effect is that any change in the throughput of the induced-draught fan is immediately reflected by a corresponding change in the forced-draught fan, resulting in the maintenance of the required combustion chamber suction, say, from 0.1 to 0.2 in. w.g., depending on the design of the plant. In some cases the functions of the two controls are interchanged, the forced-draught fan controlling the air flow and the induced-draught fan the combustion-chamber draught. On the smaller plants where there is only one fan, the question of controlling the combustion-chamber draught does not, of course, arise, and the air flow is regulated by damper or other means.

I need not deal at length here with the question of superheat control. Since a constant temperature is required, the problem of automatic control is not difficult, and we can use a comparatively simple device which measures the temperature and, on the basis of this measurement, adjusts the supply of desuperheating water, or in some other convenient way modifies the final steam temperature.

Combustion

Returning now to the question of fuel and air supply and distribution, we have a more complex problem. Unlike the cases we have considered, it is not desired to maintain constant values, but rather to maintain a constant steam pressure by varying the fuel and air supplies, while at the same time keeping the greatest possible efficiency of combustion and of heat transfer. At this stage we must make a distinction between the two ways in which fuel is burnt commercially, *viz.*: (a) solid fuel on a grate; (b) gaseous, liquid, or pulverised fuel in suspension.

Of these two methods, the latter provides much the simpler conditions because, as the fuel is fed to the combustion chamber, it comes immediately in contact with the air necessary for its combustion and so it is possible to control immediately the quantities of fuel and air taking part in the reaction. If fuel supply is shut off, heat liberation ceases almost instantly. Moreover, thorough mixing of fuel and air is easy, and thus we can ensure that practically all the fuel and air supplied to the combustion chamber play their proper part.

On the other hand, the proper combustion of solid fuel on a grate is actually a much more difficult operation. The difficulty lies in inducing the proper quality of fuel—from the large surplus present in the combustion chamber at any moment—to combine with each cubic foot of air. Too much fuel reacting with a volume of air results in the formation of carbon monoxide and other combustible gases which escape up the chimney; too little results in some unused air carrying away with it an undue proportion of the heat produced.

The Importance of Air

I have intentionally put the cart before the horse in referring to the control of the amount of fuel reacting with each volume of air. There are two good reasons for this inversion. We say that fuel burns and are apt to forget the equally important part played by air; we might do worse than remind ourselves that air burns in the presence of hot fuel. No doubt this is partly due to the fact that we do not pay for air, but only for fuel; but the loss due to letting unburnt air go up the chimney is, in practice, far more serious than the loss due to unburnt fuel.

The second reason for taking air as the primary substance involved in combustion is that we can regulate the air supply so readily, and by changing it we produce a rapid change in the rate of combustion. No such rapid change is possible when we alter the feed of solid fuel, because of the large quantity stored in the combustion chamber and because of the time required to introduce and to heat up to ignition-point any appreciable fresh supply.

How, then, do we control, in practice, the relative amounts of fuel and air which take part in the combustion? There are two methods; we adjust the thickness of the fire, and we provide a secondary supply of air over the fire. The thicker the fire, the more completely is the air used up in passing through it and the less the oxygen remaining. Beyond a certain thickness, combustible gases begin to appear in the products of combustion, and these can be burnt only by an extra supply of air which has not passed through the fire. However, it is difficult to maintain at all times the precise thickness of fire desirable over the whole area of the grate. There are several reasons for this: for example, the gradual burning away of the fuel, differences in size or moisture content, and even differences in load which require slight changes in thickness to give the best results. Accordingly, it is usual to maintain an adequate thickness

of fire and to provide sufficient secondary air to burn the combustible gases.

One of the most important of all boiler instruments is that which shows how accurately the proportioning of air to fuel has been achieved—I mean, of course, the ratio of air to fuel burnt, not of air to fuel supplied.

Flue-Gas Analysis

The basic measurement which indicates the efficiency of combustion is the analysis of the flue gases. Ideally, there should be neither oxygen nor combustible gases in the products of combustion, because the one is an indication of air having been passed through without playing any useful part, but carrying away heat; and the other is an indication of direct loss. But the ideal condition is difficult to realise in practice, and the best working result is secured when there is a small excess of air. Thus it would appear that we should analyse the flue gases for oxygen and for CO + H_2 (since these gases, carbon monoxide and hydrogen, are the most prominent combustibles found in flue gas), and we should endeavour to obtain a low percentage of oxygen and a negligible percentage of combustibles.

However, these analyses are not easy, particularly when the job has to be done by an automatic instrument, and we have come to rely on another measurement which serves equally well, namely, that of CO_2 percentage. We rely, of course, on the fact that all fuels contain large proportions—and, approximately at least, known proportions—of carbon. Thus, the CO_2 percentage is an excellent guide to the oxygen percentage and—possibly to a lesser extent—to the CO + H_2 percentage: but it does not tell the whole story.

At this point we must pause to consider whether the measurement of CO_2 alone is sufficient in commercial operation, or whether the measurement of CO and H_2 in addition is justifiable in view of the greater cost of the instruments and the relatively small increase in the information given. I suggest that the measurement of the combustible gases cannot be justified. Let me emphasise that I am referring to continuous measurement in everyday operation; periodical tests should undoubtedly be made, especially with new plant, for CO + H_2 except where the relative simplicity of the installation makes this rather superfluous. Another reason against continuous CO + H_2 measurement is the difficulty of making an instrument which has the very high standard of accuracy needed to show properly the small percentage of CO + H_2 which is to be expected in ordinary operation.

The CO_2 recorder has a poor reputation for reliability, and in fairness to this indispensable instrument, I must point out the particular circumstances which give rise to this situation. The CO_2 recorder has to analyse a gas which is notorious for its filthiness; it contains soot, tarry matter, dust, and acid vapours. Quite evidently, either the CO_2 recorder, or rather its associated sampling arrangement, must remove from the gas all these undesirable ingredients, or else the instrument must swallow them without complaint. The latter alternative has not been adopted so far and the flue gas must be cleaned and cooled. But what is to be done with the dirt? It cannot be allowed to accumulate for ever: sooner or later cleaning is needed.

This brings us to the second circumstance which has given CO_2 recorders a bad name. It is psychological rather than physical. We do not expect to lavish the same care on a CO_2 recorder as we would on the average piece of machinery. A CO_2 recorder generally operates for 24 hours per day. A motor cycle on the same basis would run some seven or eight hundred miles a day. At this rate it would cover 50,000 miles in roughly two months and would then, quite fairly, need a major overhaul. How many of us would be willing to give a CO_2 meter a major overhaul every two months? I do not suggest that it is necessary to do so, but are we not inclined to expect good service, with little or no attention, for two years or more? I do not suggest that all CO_2 meters are perfect—nor, indeed, that any CO_2 meter is anywhere near perfect—but I consider that as a class they do quite well under most unfavourable circumstances.

Automatic Control

I shall now turn to the subject of automatic pressure control. The term "Automatic Boiler Control" is to be deprecated, because it tends to convey the impression that one can leave a boiler unattended for an indefinite period. Quite apart from the possibility of any defect developing, either in the boiler plant or in the automatic controls, there are factors in boiler operation which require the skill of a human operator. This is true of all boilers, but is more important on larger plants, and particularly on all plants fired with solid fuel.

It is not a simple matter to obtain proper combustion continuously when burning coal on a grate. Variations in quality of coal, in particle size, and in moisture content, variations in load and the imperfections of mechanical (as well as human) stokers, all contribute toward the difficulty. Because of these variations, the best thickness of fire varies; and it is sufficiently difficult to keep a uniform thickness, even without the need to alter it for one or more of the reasons mentioned. Thus, we must expect variations in the flue-gas analysis, which must be

corrected by varying amounts of secondary air.

In automatic pressure control, the method universally adopted is to vary the supplies of fuel and air, according to steam pressure variations, so as to keep the pressure practically constant; and to keep a constant ratio of fuel to air, subject however to a subsidiary control which varies the ratio. If it can be ensured that the fuel and air are properly distributed within the combustion chamber so that they come into contact with each other while at a sufficiently high temperature, combustion will be good; but it is just this matter of distribution which involves the major difficulty, particularly with solid fuel burnt on a grate.

It is beyond the scope of present-day automatic boiler control to ensure perfect distribution of fuel and air. The quantities admitted will be such as to maintain the required steam pressure with a very high degree of precision. The ratio of fuel to air will be maintained with an accuracy limited only by the practical difficulties of measuring fuel flow and air flow, although the imperfections of measurement seldom prove important. But in setting the fuel/air ratio, and altering it when changes in the fuel or elsewhere require an alteration, and in maintaining correct distribution of fuel and air, human skill and experience must play their part.

Consistency of Control

Let us finally turn to the results under automatic boiler control. The outstanding effect, with all automatic control, is an improvement in the consistency with which adjustments are made. A human controller knows that under certain circumstances he has to take certain action. For example, a falling steam pressure calls for increased fan and stoker speeds. The human controller would, if pressed, explain how much he would increase the speed in the event of a certain change in steam pressure. Nevertheless, he would not always do exactly the same thing in the same circumstances, for judgment is not infallible and there is always some inconsistency in human behaviour. An instrument, on the other hand, is very consistent. It may do the wrong thing, but it does it every time. The fault is at once apparent—it is a fault in setting, that is, a fault in the instructions we have given to the instrument, and we must modify these instructions. Given the correct orders, the instrument cannot help but obey them every time, for it is an automaton. This more consistent behaviour must inevitably lead to better control, and consequently it is reasonable to expect an improvement in thermal efficiency.

I want also to bring out the point that automatic boiler control does not restrict the opportunities of the combustion engineer to apply his skill and experience. Any adjustment he may deem necessary can be made with at least the same ease and precision as with hand control. The benefit is felt in the consistent accuracy with which the regulators interpret his instructions.

DISCUSSION

Q.—Which would you suggest should be measured—steam or feed-water, and what about blow-down?

A.—There is little to choose. When a reciprocating feed pump is used, it is better to avoid the difficulty caused by pulsations by measuring the steam. On the other hand, if the steam is measured, pressure variations may introduce the need for correcting the meter readings. If both steam and water are measured, the blow-down cannot be obtained by difference because it is relatively so small.

Q.—Can you give us any information as to the accuracy of water meters? From experience with various types, I find it is of the order of 5 per cent., but that is not good enough for many purposes.

A.—Your experience must have been unfortunate. An ordinary commercial water meter should do much better than that, say 2 per cent., or 3 per cent. at the most, in everyday operation.

Q.—Can the author name a really reliable steam meter which is portable?

A.—There are several makers who can supply a perfectly serviceable portable meter.

Q.—I should like the author's views with regard to the steam-flow/air-flow meter, where the job for the operator is to keep the two pens in the right relative position one to the other. This seems a sound way of meeting the problem for a moderate-sized plant with fairly easy conditions where it is also necessary to record that the operator is on the job.

A.—The steam-flow/air-flow meter is an excellent way of doing manually what automatic boiler control does automatically, namely, maintaining the proportions of fuel and air, but that is not the whole story of combustion efficiency. A CO_2 record is also required as a check on the distribution of fuel and air, as well as on the proportions.

Q.—A CO_2 recorder is often blamed because it has a dirty job to do and fails to fulfil it satisfactorily, but a great deal can be done by means of effective anticipation. For example, the instrument should be shut off while clinkering and soot-blowing—it does not give any useful indication during these times. What are the relative merits of alundum and carborundum as gas filtering materials? There is always an annual inspection of boilers and the CO_2 recorders should be overhauled at the same time. I have used caustic soda for CO_2 recorders for many years instead of caustic potash

which is difficult to obtain, but the caustic soda must not be used at a greater concentration than 30° Tw. It will not last as long as caustic potash but is much cheaper and easier to obtain.

A.—It is not everyone who will take the trouble to shut off the CO_2 meter while clinkering or soot-blowing, but the practice is an excellent one and should be encouraged. The size of the pores in a carborundum or alundum filter is more important than the material. If the pores are large they are rapidly choked by particles of dust, which could not enter if the pores are small. Asbestos cloth is a good filter in the majority of applications. The only objections to the use of caustic soda rather than caustic potash are the lower solubility of the carbonate produced, which can lead to choking unless the concentration is kept low; and the need for more frequent recharging as a result of the lower concentration.

Servicing Instruments

Q.—Will you put your hand on your heart and say that a CO_2 recorder requires nothing more than to be kept clean?

A.—I did not claim the CO_2 recorders need merely cleaning to keep them in perfect order, although cleaning forms the greater part of the work. Any instrument needs a certain amount of attention and CO_2 recorders are no worse in this respect than any other instrument, apart from the consequences of the dirty conditions under which they are forced to work.

Q.—I should like to put in a plea that those people who have CO_2 recorders should be prepared to give them the attention which the makers recommend, or should get the makers themselves to do it. When we put in new plant we always put down in the balance sheet something for the cost of maintenance, but when instruments are put in, this aspect is often overlooked. If this question of the cost of servicing instruments received a little more publicity it would help to get the whole idea of instrumentation and automatic control in its right perspective. On some works there are sufficient instruments to keep a skilled man specially for looking after them, but in other works it seems to be better for the instrument maker to undertake the servicing.

A.—Many instrument manufacturers have a system of maintenance on the basis of a yearly charge, but that cannot cover everything because changing of charts and so on is necessarily performed by the user. It is unfortunate that there is a tendency to assume that the first cost of instruments is the only cost.

Q.—Can automatic control be looked after by the engineer, or is it necessary to call in the instrument maker?

A.—Yes, it can be looked after by the engineer.

Q.—That is the difference between this equipment and the CO_2 recorder?

A.—I would not agree with that. The CO_2 recorder could be serviced by the user if he would take the trouble, but few do.

Cost of Automatic Control

Q.—Could you give an estimate of the cost of a regulator per annum? It appears to be a delicate instrument which requires the attention of an attendant or a service engineer.

A.—The cost of maintenance is very small for automatic boiler control. It partakes of the nature of machinery rather than instruments. It is produced with a full appreciation of boiler-house conditions, and does not require much maintenance. The CO_2 recorder is in a different position because it is continually drawing in to itself extremely dirty gas.

Q.—Can you give any indication of the capital cost of boiler control, and to what extent is it dependent on the boiler output? There must be a limit below which it would not pay to put in automatic control. Would it be justified on, say, four 15,000-lb.-per-hour water-tube boilers, three in use at a time? Finally, how long are the instruments usable before they have to be scrapped?

A.—The cost is dependent rather on the complication of the boiler plant than on its size. A very rough figure for the plant described would be £2000. The question as to the smallest-size plant on which automatic control is economical is frequently asked, but the answer depends on the output of the plant, the kind of load, labour and fuel. Roughly, a battery of three Lancashire boilers is a reasonable minimum. I believe the Income Tax authorities allow 12 years as the life of this equipment, but in practice this might be safely doubled.

A. (by a visitor)—As to the life of automatic control equipment, I can affirm what the author has said. The Electricity Commissioners allow 15 years' life for ordinary instruments in power stations, but the allowance for automatic control equipment is 30 years. Therefore, I think you can take it that the Electricity Commissioners have thoroughly investigated this matter and are satisfied as to the reliability of automatic control.

Q.—It seems to me that automatic pressure control for Lancashire boilers must go hand in hand with automatic stokers, but these stokers are somewhat frowned upon at the present time. In view of this and of the present variations in fuel quality which would require frequent adjustment (by an unskilled staff) if automatically controlled stokers were used, it seems to me that automatic pressure control is a matter for the post-war period.

A.—The adjustments required by automatic pressure control to take care of different grades of coal are not complicated and can readily be made by unskilled staff. It is only necessary to alter the ratio of fuel to air and this is done by turning one knob. While I do not claim that automatic control is of universal application, variations of coal do not form an argument against it.

I have information of tests on 2000 industrial boilers over a period of years giving an average efficiency of 59-60 per cent. When fuel was at 11s. 6d. per ton the fuel cost was not important, but to-day it is very different when the price is much higher. There is great need for the Ministry of Fuel and Power to grant permits for automatic boiler control which would increase the efficiencies indicated to approximately 70-75 per cent. With increase in fuel price there is a definite case for automatic control.

In a certain power station in the North, automatic control was fitted to one boiler in 1940. It completely justified itself. Later, the workmen in the station requested that a second boiler should be similarly equipped on account of its beneficial features.

Tests on two 150,000 lb. boilers on manual control gave an efficiency of 78.1 per cent. With automatic control this was increased to 83.6 per cent., just 1 per cent. below the official boiler trial figures. Despite deterioration in coal quality and a very large number of classes of coal being burnt, recent efficiencies were to the order of 80.6 per cent., giving a balance of at least 2.5 per cent. in favour of automatic boiler control.

Q.—Can the lecturer give some idea as to the response characteristic of a boiler with rapidly fluctuating load, such as a water-tube boiler, 60,000 lb. per hour evaporation?

A.—It is impossible to give precise figures, but a substantial change in evaporation can be effected in about 3 minutes. When the load changes, the automatic control detects the fact and acts upon it in something like 10 seconds, and after that the limitation is the capacity of the boiler to pick up or drop load. The CO_2 percentage will be kept as nearly constant as is possible for that particular design of stoker.

B.C.D.T.A. Luncheon

VE-Day Celebration

MUCH credit attaches to the staff of the British Chemical and Dyestuffs Traders' Association, and especially to the indefatigable secretary, Mr. F. G. W. Paige, for arranging the annual luncheon of the Association to coincide with VE-Day. At all events, a goodly company of some 150 chemical merchants and manufacturers and their guests assembled on Tuesday at the Waldorf Hotel, London, W.C.2, where they were received by Mr. Victor Blagden, president, and Mr. G. S. Bache, chairman of the Association.

After luncheon and the loyal toasts, Major H. A. Procter, M.P., proposed the health of the Association. He stressed the importance of the merchant in the England that is to be. The merchant's aim, he said, is to satisfy the wants of the people; his reward, known as profit, is the measure of his service to the community. He indicated the danger of a combination of the vested interests of labour and of "big" business endeavouring to exterminate the independent merchant, which action was the beginning of the "corporate State." He suggested that it was the men who had been brought up in a business who had knowledge of markets and knowledge of the customer, and he claimed that it was time to begin getting rid of controls, for controls and State direction did not make for a virile nation. He appealed to members of the Association to make use of their M.P.s as their mouthpiece for any just grievance.

Mr. Blagden, responding, remarked that this Association did not merit the criticism that was so often levelled at trade associations, in that it aimed not at controlling prices, but merely at safeguarding the interests of its members. The enterprise of merchants would be a great help towards expanding our export trade to the volume that was required.

Mr. Bache, proposing "The Guests", spoke of the pride and gratitude which they all felt to H.M. Forces on this day of all days. Using military parlance, he declared it was the duty of the Association to "clear up pockets of resistance" in the bureaucratic field.

Response on behalf of the guests was made by Mr. E. Mackenzie Hay, chairman of the British Federation of Commodity and Allied Trade Associations, of which the B.C.D.T.A. is a component. He expressed the hope that the merchanting community would not suffer the fate which certain persons, who have been promoting the violation of sound industrial policy, have designed for them. They were accused, he said, of wishing to go back to the pre-war state of affairs. Such, however, was far from being the case. Merchants certainly did not want to see a renewal of import prohibitions, export quotas, bilateral trade agreements, manipulation of currencies, and so on. The economic needs of the world, not political considerations, should dictate the system of trading; and he offered it as a suggestion to the San Francisco conference that it should evolve a plan for sweeping away trade restrictions.

Major "Tommy" Knowles, Coal-Tar

Controller, who was received with acclamation, and spoke without preparation, put in a good word for the controllers. Speaking for himself, he interpreted his controllership as a stewardship of the industry for the sole purpose of winning the war. The time to abandon State control was the moment the Association was prepared to discipline itself in the national interest; State discipline would then no longer be required. But members must be loyal to the nation, as well as loyal to each other. He promised some interesting revelations when the time came for him to write his war-time reminiscences as Coal Tar Controller! Members then adjourned to hear the Prime Minister's victory message, before proceeding to the annual meeting. A report of the chairman's statement will be included in our next issue.

Personal Notes

LORD MCGOWAN has been elected a member of the Board of Management of St. Mary's Hospital, London, W.

MR. T. H. MCLAREN, of Dundee, Deputy Flax Controller, was re-elected president of the Textile Institute on May 2.

MR. HORACE W. CLARKE has been elected the first president of the recently formed Non-Ferrous Metals Federation.

MR. D. S. A. ADAMS, recently lecturer in chemistry at Rugby School, has been appointed Professor of Chemistry at Ghazi College, Kabul, Afghanistan.

MR. SAMUEL COURTAULD has been appointed by the Minister of Labour as one of the directors of the Disabled Persons Employment Corporation, Ltd.

MR. R. S. POTTER has been re-elected chairman of the Birmingham section of the Society of Chemical Industry for the 1945/46 session. DR. R. J. DOYLE succeeds Mr. J. W. Crump as honorary secretary.

DR. E. W. SMITH, who is president of the Institute of Fuel and a vice-president of the Institution of Chemical Engineers, has been appointed consultant to the British Hard Coke Association.

MR. A. G. E. BRIGGS has been released from the post of Deputy Controller of Iron and Steel Supplies by the Minister of Supply, as from April 30. His services, however, will continue to be available in an advisory capacity. MR. K. G. LAMPSON has been appointed Deputy Controller.

MR. F. Q. LOBB, production manager, Lever Brothers (India), Ltd., and MR. K. M. ANTIA, general manager, Tata Oil Mills Co., Ltd., have been nominated respectively by the Bombay Chamber of Commerce and the Indian Merchants' Association to represent the coconut oil industry on the newly-constituted Indian Coconut Committee.

MR. F. D. ASCOLI has been released by the Minister of Supply from his post as Rubber Director. He will, however, continue to be available in an advisory capacity. His successor is MR. J. RIDDELL, deputy Director of Rubber.

LORD RAYLEIGH has been elected president of the Royal Institution of Great Britain, in succession to Lord Eustace Percy. SIR ROBERT ROBERTSON continues as treasurer, and DR. A. O. RANKINE becomes secretary in place of Major C. E. S. Phillips.

MR. FELIX LEVY, a director of George Cohen, Sons & Co., Ltd., who was seconded in September, 1939, to the Ministry of Supply, where he has been Assistant Director of Scrap Supply, has now been released in order to devote his time to the administration of the Cohen group of companies.

At the recent annual meeting of the Titanium Pigment Manufacturers' Specification Committee, MR. W. A. CASH, of British Titan Products Co., Ltd., was elected chairman and DR. A. N. C. BENNETT, of National Titanium Pigments, Ltd., as secretary for the coming year.

MR. H. H. BERRESFORD, chairman of the Staveley Coal & Iron Co., Ltd., and chairman of the Council of Iron Producers, has been selected as president of the Joint Iron Council, a new national trade organisation created last week. MR. V. DELPORT has been appointed joint secretary, and until offices have been chosen for the new Joint Council, correspondence with regard to it should be addressed to him at 2 Caxton Street, London, S.W.1.

DR. HAROLD HARTLEY, technical director and a managing director of Radiation, Ltd., has been nominated president-designate of the British Cast Iron Research Association, which he has served as chairman of Council since 1936. The presidency has been vacant since the death of Mr. Percy Pritchard last February at the early age of 52, but the Association's rules prescribe that a president cannot be elected except at the annual meeting.

Obituary

MR. W. R. HANN, whose death has occurred in London, was a director of Cardiff Collieries and of the National Benzole Company.

MR. RODERICK COUPER, of Joseph Townsend, Ltd., chemical manufacturers, died at Glasgow on April 26. He was well known in the city trade in which he had been engaged for many years.

LIEUT. DOUGLAS LISTER MORRISON, R.N.V.R., who has now been presumed lost in action on March 18, carried on business as an oil and paint manufacturer under the name of Robert Morrison & Co., in Glasgow, until he was called up at the outset of war.

South African Notes

Sodium Carbonate—DDT—Agar-Agar

THE only important deposit of sodium carbonate so far discovered in South Africa occurs in the Pretoria saltpan, 26 miles from the city. Boreholes to a depth of about 30 ft. have been sunk at intervals over the floor of the pan to tap the brine in the gaylussite layer. From these boreholes a solution containing approximately 9 per cent. of sodium chloride, 4 per cent. of sodium carbonate, and subordinate amounts of sodium bicarbonate is pumped to a reservoir on the rim of the pan from where it gravitates to the treatment plant. From there it goes to a triple effect evaporator. The saturated brine from the evaporator is first cooled to atmospheric temperature in a cooling tower, thereafter pre-cooled to 60° F., and then cooled in a refrigerating plant to a temperature of 20° F. Refrigeration is carried out in concrete tanks by ammonia, as in cold storage practice. During the process, washing soda crystallises out and sodium chloride stays in solution. The separated mixture of crystals and adhering salt is pumped to hydro-extractors and there separated. The crystals of washing soda or decahydrate, containing 33 per cent. anhydrous sodium carbonate and 2 per cent. sodium chloride, are bleached by chloride and then boiled down to crystallisation in a vacuum pan, where the monohydrate is formed, containing 80 per cent. of anhydrous sodium carbonate and 1 per cent. sodium chloride. This eventually yields a soda ash containing 97 per cent. of anhydrous sodium carbonate.

* * *

In view of the difficulties experienced in the past by local importers in securing supplies of potassium nitrate from India because of the restricted licence of Indian exporters, the Union Government has negotiated with the Indian Government for the release of enough of this chemical for South Africa's essential requirements, says a statement issued by the Director-General of Supplies. The arrangement permits its procurement through commercial channels. Because of the scarcity of potassium nitrate, imports at this stage can only be sponsored if the chemical will not be used as a fertiliser.

* * *

Owing to the improvement in the supply position, zinc may now be used in South Africa for protective purposes in the manufacture of land and marine boilers, and up to 20 lb. of zinc may now be used for the manufacture of zinc chloride or zinc sulphate without a permit. The Controller of Non-ferrous Metals must, however, still be notified of the specific purpose for which such zinc will be used.

Several changes in rates of customs duty in South Africa were announced recently, and a rebate of the whole duty is now allowed on imports of the following chemicals for use in the industries specified: calcined magnesite for use in the brickmaking industry and in the manufacture of magnesite bricks; powdered pectins for use in the manufacture of jelly from grape concentrate; and hardened crude groundnut oil for use in the soap manufacturing industry.

* * *

In reply to a question in the House of Assembly, the Minister of Welfare said that he was prepared to make DDT, the new insecticide, available to the public, but only for experimental purposes. At present it was not possible to obtain supplies from overseas. A pilot plant was producing small quantities of DDT in the Union and these had been tested with satisfactory results. A factory capable of producing all the Union's needs was nearing completion.

* * *

There is a possibility of the seaweed on the Cape beaches being used to manufacture certain chemicals. A Johannesburg concern has applied for concessionary rights at Hout Bay and Kommetje, in the Cape Peninsula, to cultivate seaweed and to produce fertilisers as well as other products. In order to make fertilisers, the kelp favoured by crawfish would be good enough, but it is expected that the concern will devote itself to growing agar-agar seaweed. A Cape Town chemical concern, trading its supplies at Langebaan, in Saldanha Bay, showed last year that the collection and processing of agar-agar seaweed can be made profitable. Agar-agar is being processed in South Africa to supply the urgent need for incubation bases for bacterial cultures, and in the future it may also be on sale to patent medicine manufacturers, sweetmakers and bakers, and for use as a soothing material in tinned soups and other canned food products.

* * *

Large deposits of minute shells, probably from the floor of an extinct inland lake, have been discovered in the Calvinia district. Tests made show that they are of a high calcium content and abnormal yields of grain have been reported after the use of the shells as a soil improver. The managing director of the Premier Paper Mills of Johannesburg visited the area of the deposits and later stated that they extend over many square miles and the indications are that they will help considerably to reduce the cost of soil improvers to farmers. A processing plant, with a capacity of about 10,000 tons per month, is soon to be erected.

General News

From Week to Week

Aluminium Alloy Castings for General Purposes (DTD Specification No. 424), incorporating amended lists Nos. 1 and 2, has just been reprinted (H.M.S.O., 1s.).

At a meeting of the executive committee of the South-West Durham Development Board last week it was reported that investigations into the quality of Weardale and Teesdale limestones had not found one, so far, suitable for the production of carbide of calcium.

A review of commercial conditions in British East Africa is the latest of the series covering 26 countries, prepared by the D.O.T. to assist firms with their post-war export plans. Reviews of commercial conditions in Argentina, Uruguay, Sweden and Portugal are further additions to this informative series (price 6d. each).

"Achievement in the Art of Healing" (London: Pilot Press, 2s. 6d.) presents, in popular illustrated form, details of modern methods of treating wounds and diseases. A section is devoted to penicillin and another to the sulphonamides, and, though the pictures are not new, it is recorded that improvements in manufacturing methods have been made since they were taken.

I.C.I. announce the completion of an option to purchase over 1000 acres of land on the south bank of the River Tees, near Eston, in the Guisborough district, for industrial development. Mr. A. T. S. Zealley, of the concern's Billingham division, added that this would result in a considerable increase of employment and business. The enterprise, will be separate from the I.C.I's activities at Billingham.

To encourage the reading of papers by student members of the Institute of Fuel, also those taking courses at universities and technical colleges, the council have decided to make an annual award of a medal, together with a prize consisting of books and instruments to the value of £5. The rules governing this award may be obtained on application to the secretary, the Institute of Fuel, 30 Bramham Gardens, London, S.W.5.

The Aluminium Development Association, the formation of which was reported in THE CHEMICAL AGE of April 21, has appointed its first council consisting of the Hon. Geoffrey Cunliffe (president), Mr. Horace W. Clarke (vice-president), Mr. D. Cannon Brookes, Mr. W. C. Devereux, Mr. H. E. Jackson, Mr. E. Player, Mr. Austyn Reynolds and Mr. G. A. Woodruffe. The Association intends to open offices in London, in addition to its present offices at 63 Temple Row, Birmingham, 2.

The Ministry of Food announces that there will be no change in the existing prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the four weeks ending June 2, 1945.

The new board of management of the British Colour Council numbers among its members for the first time a woman, who has also been elected chairman of the board. This is Mrs. Donald Bird, managing director of Messrs. L. Copley Smith and Sons, Ltd.

Presiding at a conference on industrial accident prevention in London last week, Sir Wilfrid Garrett, Chief Inspector of Factories, estimated that there were 11,500,000 accidents every year in the factories of Great Britain. We were killing in our factories every year about 1000 people and in the mines 800. He hoped to be able to report not a single case of lead poisoning in the Potteries this year.

Delivering the Mather lecture to the Textile Institute at its annual meeting in Manchester last week, Dr. C. J. T. Cronshaw, of the I.C.I. (Dyestuffs Division), chose as his subject "Pattern for Industry." Research and production within industry, he said, are patterned together in an abiding relationship. To achieve a great export business was only possible by deploying in our industries such an abundant measure of superlative skill that discovery and invention become almost a habit.

Foreign News

The equipment of Yugoslavia's only aluminium plant, located at Lozorac, near Sibenic, was evacuated by Italy during the war.

In France, about 200,000 industrial plants have been destroyed or heavily damaged during the war, said M. Raoul Dautry, Minister of Reconstruction.

Penicillin is now available for export from the U.S. on a commercial scale to all areas, says Reuter. The amount for each country will be decided by the Administration. Since June, 1944, when the U.S. first exported penicillin, the amount distributed abroad has increased by 700 per cent., and 43 countries are to-day receiving supplies.

Control of graphite from Madagascar and Reunion has been eased, and the material has been removed from the list of products reserved for official purchase by Allied Governments only. An agreement relating to graphite has been signed between a representative of the French Government and representatives of the British, U.S., and South African Governments.

An order which provides for the addition of dyes and dyestuffs to the schedule to open general licence No. 4 has been passed in Ceylon.

Imports into Canada of cumene and of benzol, when imported for use in the manufacture of cumene, are duty and tax free, while imports of nicotine, its salts and preparations for dipping, spraying, or fumigating, are subject to permit by the Administrator of Fertilisers and Pesticides.

Monsanto Chemical Co., of St. Louis, Mo., has announced that it is planning to produce aluminium metaphosphate after the war, predicting that the product will open new advantages to glass manufacturers, because glass manufactured from aluminium metaphosphate, transmits a substantially greater amount of ultra-violet light. They show improved melting and working characteristics and improved resistance to certain acids.

Canadian General Electric Company, Ltd., has announced that construction of a new $400,000 plant addition for the manufacture of synthetic resins will begin shortly at the company's Davenport Works in Toronto. The plant will be in full operation in July, company officials say. Chemical processing equipment installed will be of the most advanced type employed for the manufacture of these synthetics.

In Chile, output of coal during 1944 was practically the same as in 1943, namely, 2,275,719 tons. Production of nitrate of soda declined by 23 per cent. from 1,297,788 tons in 1943 to 998,512 last year. Statistics concerning copper mined—which since the entry of the U.S.A. into the war were not made public—show that the annual production of copper bars was 490,441 tons in 1944. Output of gold amounted to 6,337 kilos.

The harvesting of seaweeds on the north and west coasts of Spain, for the manufacture of agar-agar, officially recognised by the Ministry of Marine in 1942, is shortly to be the subject of a regulation framed by a committee of official and industrial technologists, according to F. Cabrero Gómez (*Ion*, 1945, 5, 105), with a view to the conservation of Gelidiaceæ, notably *Gelidium corneum*, which occurs in commercial quantities on the coasts of Galicia and Santander.

The Standard Oil Company of New Jersey states in its annual report for last year that about $9,000,000 and 3,000,000 man hours were expended on research and development. This work will substantially increase 100-octane fuel production; it includes research on jet propulsion fuels, and the large-scale production of butyl rubber is said to have been solved. One-half of all the synthetic toluene needed by the United Nations to make T.N.T. was produced by the concern's affiliates and so were 14.5 per cent. of all the butadiene for synthetic rubbers in the U.S.A. and Canada.

Among new chemical plants planned in Spain are a factory at Oviedo for the production of synthetic cryolite from fluorspar, with a daily output of 500 kg. (J. Valdés Cores), and a titanium dioxide works at Bilbao, with an annual output of 600 metric tons (Unión Química del Norte).

Casein hydrolysate was used with success in Calcutta during the recent famine to revive moribund individuals and restore them to health; and it is now being supplied to the inmates of concentration camps in Germany and to Dutch civilians, both in the standard form and in a form suitable for intravenous injection for cases *in extremis*.

Cellulose-nitrate plastics, particularly in sheet form, are in demand in Southern Brazil. After the elimination of supplies from Germany and Japan, the principal pre-war sources, and curtailment of shipments from the United States, imports dropped sharply in 1943 and 1944. In the post-war period, competition from other sources may be expected because of the higher prices of the United States product, which now dominates the market.

In Sweden, imports of common salt, as well as stocks in the country, have been subjected to control by the State Food Commission. This measure became necessary because Sweden has reduced its trade with Germany (the principal salt supplier) to a minimum. The ration for individual consumers has been established as 1 kg. *per capita* for the period January 7 to April 10. In 1939, imports totalled about 252,000 tons, as compared with 107,000 tons in the first six months of last year.

French chemical prices were raised by over 40 per cent., on April 15, for caustic soda, soda crystals, sodium bicarbonate, and sulphuric acid, and substantial advances were also decreed for chlorine and calcium chloride, compressed and liquefied gas, mercury, sulphur, paraldehyde and a large number of other chemical products. The French export trade in chemical products has been resumed on a small scale with shipments of pharmaceuticals and cosmetics to North Africa; as yet these do not exceed 30,000 tons a month.

The acquisition of the Irwin Dyestuff Corporation, Ltd., by the Dominion Rubber Company, Ltd., has been transacted. The Irwin Corporation will act as sales outlet in Canada for various chemicals, and will complement the activities of the Naugatuck Chemicals Division of Dominion Rubber. The management and personnel of the acquired company remained unchanged. Dominion Rubber Company has established a large research laboratory at Guelph, Ontario, which is proving an invaluable aid in the rapidly-expanding field of rubber chemicals and synthetics.

Chaplin Sodium Sulphate, Ltd., has been formed at Lake Chaplin, Saskatchewan. It will acquire mineral leases on the Lake Chaplin sodium sulphate deposit and will undertake its development. The lake is estimated to contain a total of 15,000,000 tons of salt, probably the largest deposit of its kind in North America."

Forthcoming Events

May 16. Royal Society of Arts. John Adam Street, Adelphi, W.C.2. 1.45 p.m. Professor J. D. Bernal, F.R.S.: "The Social Relations of Science." (Trueman Wood Lecture.)

May 16. Royal Institute of Chemistry. Rooms of the Chemical Society, Burlington House, Piccadilly, London, W.1. 6 p.m. Dr. E. C. Barton-Wright: "The Theory and Practice of the Micro-biological Assay of the Vitamin B Complex, Selected Amino-Acids and Potassium."

May 16. Chemical Engineering Group (S.C.I.). Waldorf Hotel, Aldwych, London, W.C.2. 12.15 p.m. Annual meeting, at which business will include the declaration of elections to the General Committee and notification of the election of honorary officers. 1 p.m. Annual luncheon, at which a record attendance is hoped for. Applications for tickets (15s. each) should reach the Hon. Secretary, at 56 Victoria Street, S.W.1, not later than May 11.

May 17. Chemical Society. Royal Institution, Albemarle Street, London, W.1. 5 p.m. Professor J. D. Bernal, F.R.S.: "The Past and Future of Crystal Chemistry." (Hugo Müller Lecture.)

May 30. Society of Chemical Industry (Plastics Group). The Royal Institution, Albemarle Street, London, S.W.1. 3 p.m. Mr. H. V. Potter: "Leo Hendrik Baekeland —The Story of His Life" (First Backeland Memorial Lecture).

May 30. Society of Chemical Industry (Plastics Group). Stewart's Restaurant, 50 Old Bond Street, London, W.1. 11 a.m. Annual General Meeting. Luncheon: 12.30 for 1 p.m. Applications from members, accompanied by a remittance for 6s. 6d., should be made to the Hon. Hospitality Officer, Mr. W. H. Langwell, The Garth, Windmill End, Epsom.

New Companies Registered

Warner Sinclair & Co., Ltd. (395,069).—Private company. Capital, £1200 in 1200 shares of £1 each. Manufacturers of and dealers in printing and other inks, paints, varnishes, enamels, chemicals, etc. Subscribers: Agnes Walmsley (first director); Doris R. Barton. Registered office: 6 Broad Street, Place, E.C.2.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

WRIGHT & WEAIRE, LTD., London, N., engineers and scientific instrument manufacturers. (M., 12/5/45.) April 17, debenture, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *£250. December 5, 1944.

BROOKS' DYE WORKS, LTD., Bristol. (M., 12/5/45.) April 12, charge, to Bristol Permanent Economic Building Society, securing £6000 and any other moneys, etc.; charged on 88 Park Street, St. Augustine-the-Less, Bristol. *£25,094. March 31, 1944.

WILLIAM RANSOM & SON, LTD., Hitchin, manufacturing chemists. (M., 12/5/45.) April 16, £5000 debentures; general charge. *£5000. August 31, 1943.

JAMES E. SMITH (WAKEFIELD), LTD., chemical manufacturers. (M., 12/5/45.) April 11, mortgage, to Dewsbury & West Riding Building Society, securing balance of an account current; charged on 86 Westgate, Wakefield.

Satisfactions

PROMEDICO PRODUCTS, LTD., London, N. (S., 12/5/45.) Satisfactions April 17 of assignations registered October 8 and 19, 1943.

MERSEY WHITE LEAD CO., LTD., Warrington. (S., 12/5/45.) Satisfaction April 23, £60,000, registered June 30, 1906.

BRITISH BURMAH PETROLEUM CO., LTD., London, E.C. (S., 12/5/45.) Satisfaction April 20, of debenture stock registered February 25, 1936, to the extent of £20,000.

ASHDAY FIRECLAY CO., LTD., Huddersfield. (S., 12/5/45.) Satisfaction April 19, of charge registered July 8, 1940.

Company News

The Amalgamated Metal Corporation reports a net profit, for the year to March 31, of £210,814 (£212,617). The dividend is 3½ per cent. (same).

The United Turkey Red Company, Ltd., announces a trading profit, for 1944, of £210,601 (£149,941). Taxation: £141,413 (£27,800). The company is to clear all arrears on its 4 per cent. first cumulative preference shares.

The British Match Corporation records a net profit of £347,240 (£350,184). The final ordinary dividend for the year ended April 30 is 5¼ per cent., making 8 per cent. (same).

Chemical and Allied Stocks and Shares

BUSINESS in stock markets has continued on a small scale, attention being centred on the events in Europe, and gilt-edged stocks, as well as industrials, were lower on balance. There was, however, no pronounced profit-taking in markets, reflecting confidence in the future. Industrial shares are at levels showing only small yields on the basis of current dividends, and in many cases it would seem that prices discount the possibility of improvement in dividends during the post-war period; although it is recognised that many factors have to be considered which are not clearly defined at this stage, such as the relaxing of war-time controls and reduction in the weight of taxation. There are conflicting views whether the upward trend of values on the Stock Exchange, which has been strongly in evidence for a considerable period, has reached its peak. Possibly the market trend will remain uncertain until after the General Election, and it must be expected that, with the switchover to peace-time working, money will find greater scope for employment in industry, and some selling of securities may be expected on this account. Nevertheless, granted there is a good measure of success in dealing with the problems of the change back to peace-time working, this would, in the normal course of events, find reflection in the value of industrial shares. Moreover, it has been repeatedly emphasised that the Government's cheap money policy is to be continued. This being the case, the assumption in many quarters is that over a period British funds are more likely to rise further in price than to recede.

Following their recent further rise, industrial shares, as was the case a week ago, have moved back, but this has been due more to falling-off in demand than to selling. Since the fall in security values in the early days of the war, there has been a remarkable advance in industrial shares, which, in many cases, have regained the best levels touched in the immediate pre-war years. There were, of course, more or less sharp fluctuations from time to time, when sentiment was dominated entirely by the nature of the war news, as, for example, during the critical days of the fall of France.

The present occasion is opportune to make a short comparison of current prices of some leading shares of chemical and kindred companies with those touched in the early months of the war. Imperial Chemical, now 40s., were then 25s. Lever and Unilever, then 27s., are now 49s. 3d. De La Rue, then 38s. 6d., are now £11, while B. Laporte, down to 55s. in September, 1939, have since moved up to 90s. Courtaulds, then 22s. 10½d., are now 56s. 3d., and Borax Consolidated deferred, then down to 19s., are now 44s. Boots Drug touched 31s. 10½d. in 1939, comparing with the current level of 54s. 3d.

In the iron and steel section the rise over the same period has, perhaps, not been so marked, because for some while before the war rearmament was bringing increased business to the heavy engineering industries, and this was reflected in share values. Dorman Long's lowest level in 1939 was 20s. or 8s. below that now ruling. Stewarts and Lloyds, down to 25s. in 1939, are now 56s. 6d. Guest Keen, 20s. at one time in 1939, are now 39s. Stanton Ironworks, then 34s. 6d., are now 54s. 6d., while Tube Investments, 68s. 1½d. at one time in 1939, are now £5½. Elsewhere, Triplex Glass fell to 17s. 6d. under the early influence of the war, and are now 42s. United Glass Bottle, down to 40s. in 1939, are now 75s. In the early stages of the war oil shares were inclined to benefit from the big demand expected for petrol, but war-time regulations and controls prevented increased profits. Shell, 75s. in the early stages of the war, are now 87s. 6d.

British Chemical Prices

Market Reports

MOST of the leading industrial chemicals are moving along steady lines and makers' deliveries against contracts during the past week have been well maintained. With regard to new business, supplies of a number of products are much below the current demand, while a firm tone is in evidence for those chemicals for which reasonable quantities are being freely offered. In the soda products section a steady inquiry is reported for Glauber salt and salt cake, while caustic soda and acetate of soda are in good demand. There is a keen inquiry for the limited supplies of bichromate of soda. Strong price conditions are operating for most of the potash products in which section the tight supply position is the chief feature. Elsewhere, a good demand is reported for formaldehyde and also for glycerine and borax. In the coal-tar products section there is a ready outlet for both creosote oil and carbolic acid. Firm prices are operating for xylol and a moderate trade is passing in naphtha. The benzols and toluols are steady.

Price Changes

From May 1 the prices for dry lead oxides are reduced £2 per ton. The reduction also applies to undelivered balances of existing contracts and orders in hand. The revised prices are: Genuine dry red lead £41 per ton, genuine dry litharge £41 per ton, and genuine dry orange lead £53.

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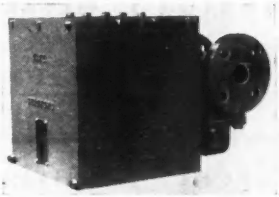

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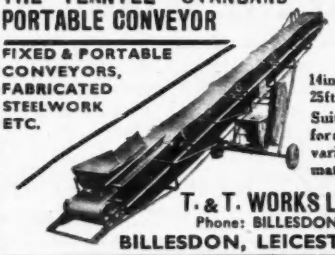
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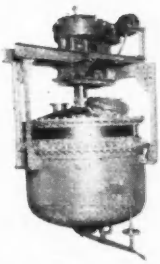

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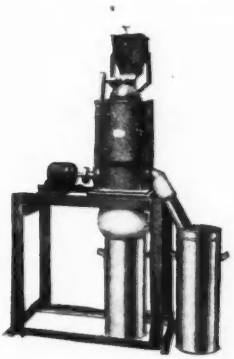

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